manner as to determine both their *periodical* variations (the changes which occur in the period of a day, and of a year), the *secular* changes, as the gradual increase or diminution of the declination at the same place for many years; and the *irregular* fluctuations which, as we have said, are simultaneous over a large part, or the whole, of the earth's surface.

When these Facts have been ascertained over the whole extent of the earth's surface, we shall still have to inquire what is the Cause of the changes in the forces which these phenomena disclose. But as a basis for all speculation on that subject, we must know the law of the phenomena, and of the forces which immediately produce them. I have already said that Euler tried to account for the Halleian lines by means of *two* magnetic "poles," but that M. Hansteen conceived it necessary to assume *four*. But an entirely new light has been thrown upon this subject by the beautiful investigations of Gauss, in his *Theory of Terrestrial Magnetism*, published in 1839. He remarks that the term "poles," as used by his predecessors, involves an assumption arbitrary, and, as it is now found, false; namely, that certain definite points, two, four, or more, acting according to the laws of ordinary magnetical poles, will explain the phenomena. He starts from a more comprehensive assumption, that magnetism is distributed throughout the mass of the earth in an unknown manner. On this assumption he obtains a function V, by the differentials of which the elements of the magnetic force at any point will be expressed. This function V is well known in physical astronomy, and is obtained by summing all the elements of magnetic force in each particle, each multiplied by the reciprocal of its distance; or as we may express it, by taking the sum of each element and its proximity jointly. Hence it has been proposed[16] to term this function the "*integral proximity*" of the attracting mass.[17] By using the most refined ma-

[16] *Quart. Rev.* No. 131, p. 283.

[17] The function V is of constant occurrence in investigations respecting attractions. It is introduced by Laplace in his investigations respecting the attractions of spheroids, *Méc. Cel.* Livr. III. Art. 4. Mr. Green and Professor Mac Cullagh have proposed to term this function the *Potential* of the system; but this term (though suggested, I suppose, by analogy with the substantive *Exponential*), does not appear convenient in its form. On the other hand, the term *Integral Proximity* does not indicate that which gives the function its peculiar claim to distinction; namely, that its differentials express the power or attraction of the system. Perhaps *Integral Potentiality*, or *Integral Attractivity*, would be a term combining the recommendations of both the others.